



# The Effect of Tambsil Organic Fertilizer on The Growth And Results of Onion (*Allium Ascalonicum L.*) In Lowland

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## ABSTRACT

This study aims to determine the effect of tambsil liquid organic fertilizer on the growth and yield of onion and find out the optimum dosage. This is a Randomized Block Design (RBD) consisting of five (5) treatments with three (3) replications and two (2) sample plants. Treatment in experimental plot was conducted randomly. Tambsil liquid organic fertilizer consists of six (6) doses including DT0 = without Tambsil liquid organic fertilizer (Control); DT1 = Tambsil liquid organic fertilizer 2.0 ml/liter of water/plant; DT2 = Tambsil liquid organic fertilizer 4.0 ml/liter of water/plant; DT3 = Tambsil liquid organic fertilizer 6.0 ml/liter of water/plant; DT4 = Tambsil liquid organic fertilizer 8.0 ml/liter of water/plant; DT5 = Tambsil liquid organic fertilizer 10.0 ml/liter of water/plant. The dose of Tambsil liquid organic fertilizer provides significant effect on the observation variables of plant length, number of leaves, number of bulbs and gross weight per clump of onion (*Allium ascalonicum L.*). The dose of Tambsil liquid organic fertilizer (DT4) 8.0 cc per liter of water always shows the highest growth and yield of onion (*Allium ascalonicum L.*) while statistically, BNT 5% is not significantly different from the treatment of Tambsil liquid organic fertilizer (DT3) 6.0 cc per liter of water (optimum dose) and (DT4) dose of 10.0 cc per liter of water.

**Keywords:** Dose of Liquid Organic Fertilizer, Tambsil, Red Onion

## 1. INTRODUCTION

According to data from the Central Bureau of Statistics (2014), the area of onion plantation in Indonesia in 2013 was 98,937 ha with a production of 1,010,773 tons. In East Java Province, the onion harvest, production, and productivity in 2013 were 1,048 ha, 8,305 tons, 7.92 tons / ha respectively which decreased compared to the previous year of 1,581 ha harvested area, production of 14,158 tons and productivity of 8.96 tons / ha in 2012. In Central Java as one of the centers of onion production, productivity reached 11.43 tons / ha. While the difference in productivity is not too significant, the productivity of onion in East Java needs to be maximized (Hariyadi, Ali, & Pratiwi, 2018). The low productivity in East Java is caused by the lack of technical system in its cultivation, especially fertilization.

Fertilization is one of the determining factors in an effort to improve crop yields. The use of fertilizer as recommended is expected to provide profitable harvest. Thus, the expected impact of fertilization does not only increase yield per unit area but also efficiency and effectiveness. This



is because the use of fertilizer at the farm level is quite high that it can cause problems, especially deficiencies in micro nutrients, soil compaction, and environmental pollution (Ersa Purwanti. 2017).

The growth of plants is strongly influenced by the availability of nutrients in the soil and fertilizer application. Nutrient uptake is limited by low nutrients (Leibig Minimum Law). Thus, low nutrient control the process of plant growth. To achieve optimal growth, all nutrients must be balanced, meaning nutrient should not be a limiting factor.

Productivity and quality of plants can be increased in some techniques including the use of compound fertilizers combined with macro elements, macro-micro, multi-micro, micro nutrients and hormones, as well as growth regulators The application method also varies including those given through leaves (Nisak, Pratiwi, & Ali, 2017).

According to Estu, Rahayu., dan Berlian VA, Nur. 2007 there are several factors that cause low onion production, including low soil fertility, limited availability of water, use of non-uniform and low-quality seeds, limited farmers' knowledge of onion cultivation and improper fertilization techniques.

Furthermore, Rizqiani, N. F., Ambarwati, E., and Yuwono, N. W. (2007), state that nutrient availability for plants is provided by adding nutrients through fertilizer application, either through soil or through leaves. Availability of nutrients in sufficient and balanced soil is one of the keys to the successful cultivation of onion.

Jamilah, Erianto dan Fatimah. (2017). Reported that the administration of Crocober POC made from Crocober odorata and coconut fiber produced through the Non Aerated Fermentation (NAF) process with a concentration of 50 ml/ liter every week can increase the yield of onion. This chemical reaction of POC greatly determines the level of nutrient uptake which diffuses into the leaves through the cuticle or stomata layers.

Provision of liquid organic fertilizer into the soil not only plays a role in increasing crop production but also in the soil by supplying organic matter and nitrogen in the soil and improving soil physical properties (Setiyowati. 2002).

A research by (Permadi, A.H. 1995). found that treatment with Titonia liquid organic fertilizer dose significantly affected the number of leaves aged one week. The treatment of the time interval given significantly affected the four-week-old plant height, tuber diameter per sample and tuber dry weight per plot. In general, the best treatment for administering Titonia liquid organic fertilizer is 12.00 ml per plant, while the best treatment for the time interval for giving Titonia liquid organic fertilizer is four days. The interaction of the two factors did not significantly affect all parameters of the observation of shallots.



A research conducted (Hariyadi et al., 2018) shows that the administration of Tambsil liquid organic fertilizer had a very significant effect on plant height, leaf number and wet weight per plant in land spinach polybag (*Ipomoea reptans Poir*). The treatment of liquid fertilizer organic fertilizer in dosage of 10 cc/liter of water tends to produce the highest (maximum) growth and yield of land water spinach (*Ipomoea reptans Poir*) while it is not statistically significantly different from the treatment of Tambsil liquid organic fertilizer 8 cc/liter of water (optimum).

Fertilizing applications sourced from liquid organic fertilizers, both dosage and timing, have not been widely carried out. In order to add insight to the agricultural community about the liquid organic fertilizer, the testing of the effects of liquid organic fertilizer, especially Tambsil liquid organic fertilizer on the shallot plant (*Allium ascalonicum L.*) was carried out.

## 2. METHOD

The research was conducted at the Experimental Garden of the Faculty of Agriculture, Merdeka University Surabaya, Ketintang Madya VII-2 Surabaya, East Java with a altitude of  $\pm 5$  m above sea level. The research was conducted from May to June 2018. The research materials included planting soil, compost, NPK fertilizer, Tambsil liquid organic fertilizer and onion tuber seeds (4 month dormancy). The tools used are hoes, blades, knives, polybags (5 kg media size), labels, rulers, stationery, weight gauges and electric scales as well as other laboratory equipment.

This study aims to determine the effect of tambsil liquid organic fertilizer on the growth and yield of onion and find out the optimum dosage. This is a Randomized Block Design (RBD) consisting of five (5) treatments with three (3) replications and two (2) sample plants. Treatment in experimental plot was conducted randomly. Tambsil liquid organic fertilizer consists of six (6) doses including DT0 = without Tambsil liquid organic fertilizer (Control); DT1 = Tambsil liquid organic fertilizer 2.0 ml/liter of water/plant; DT2 = Tambsil liquid organic fertilizer 4.0 ml/liter of water/plant; DT3 = Tambsil liquid organic fertilizer 6.0 ml/liter of water/plant; DT4 = Tambsil liquid organic fertilizer 8.0 ml/liter of water/plant; DT5 = Tambsil liquid organic fertilizer 10.0 ml/liter of water/plant.

To determine the effect of Tambsil liquid organic fertilizer on the growth and yield of onion, F test with a level of 5% was used, i.e Variety Analysis Test (ASR). If from the F% 5% test results shows a real effect, T Test (Smallest Significant Difference Test) is continued with a level of 5% in order to find out the difference between the treatment of Tambsil liquid organic fertilizer to find its effective dose (Adji Sastrosupardi, 1999 and Bambang Wicaksono Hariyadi, 2017).



### 3. RESULTS AND DISCUSSION

#### 3.1. Plant Length per Clump

The results of the variance analysis indicates that the use of Tambsil liquid organic fertilizer had a very significant effect on the onion plant length at the age of 20 days, 40 days and 60 days after planting (Appendix Table 1).

This proves that macro nutrients and micro nutrients contained in Tambsil liquid organic fertilizer are useful in the growth of onion plants. Tambsil liquid organic fertilizer will increase the availability of sufficiently large nitrogen into the soil. In the process of protein formation which will then be used in the process of composing and dividing cells, tissues and organs takes place quickly with the use of the fertilizer. The function of nitrogen as fertilizer is to improve the vegetative growth of plants and help the process of protein formation (Hardjowigeno, 2003).

Lingga and Marsono (2004) states that liquid organic fertilizer contains a lot of macro nutrients and essential micro nutrients (N, P, K, S, Ca, Mg, B, Mo, Cu, Fe, Mn, organic matter). Liquid organic fertilizer has several benefits, including encouraging and increasing chlorophyll formation, thereby increasing plant photosynthesis ability and absorption of nitrogen from the air, increasing plant vigor that plants become sturdy and strong, increasing plant resistance to drought, weather stress and disease pathogens, stimulates the growth of production branches, increases the formation of flowers and ovaries, and reduces the loss of leaves, flowers and ovaries.

**Table 1.** The Average Length of Onion Plants per Clump with the Supply of Tambilli Liquid Organic Fertilizers in Various Doses and Age of Observation

Dosage Treatment Tambsil Liquid Organic Fertilizer	Average Plant Length Onion per Clump		
	20 days (cm)	40 days (cm)	60 days (cm)
DT0 = Without Tambsil Fertilizer (Control)	18,67 a	25,33 a	32,33 a
DT1 = Tambsil Fertilizer 2,0 cc per liter water	23,00 b	31,00 b	39,33 b
DT2 = Tambsil Fertilizer 4,0 cc per liter water	24,67 c	33,33 c	42,00 c
DT3 = Tambsil Fertilizer 6,0 cc per liter water	25,33 cd	35,33 d	45,33 d
DT4 = Tambsil Fertilizer 8,0 cc per liter water	26,00 d	36,67 d	46,33 d
DT5 = Tambsil Fertilizer 10,0 cc per liter water	25,67 d	36,00 d	45,67 d
BNT 5%	0,95	1,45	2,12

Note: The numbers accompanied by the same letters in the same column are not significantly different from the 5% BNT Test



Table 1. shows that increasing the dose of Tambsil Liquid Organic fertilizer on onion plants will be followed by an increase in plant length. However, the increasing dose caused the decrease in the length of the plant. The longest red onion plant is achieved with Tambsil liquid organic fertilizer (DT4) dosage of 8.0 cc per liter of water (46.33 cm), although statistically (BNT 5%) is not significantly different from (DT3) of 6.0 cc per liter of water (45.33 cm) and (DT5) of 10.0 cc per liter of water (45.67 cm). The shortest red onion plant was gained with non Tambsil liquid organic fertilizer (DT0) (32.33cm) and the treatment was statistically significantly different from other treatments.

It is presumed that the administration of Tamblil liquid fertilizer on onion plants increase the availability of nitrogen elements in the soil, thus, when nitrogen element is needed by plants to form tissue or growth organs, the nitrogen element is available and sufficient. However, if the dose of Tambsil liquid organic fertilizer is reduced, the level of nitrogen element availability also decreases. Conversely, an increase in the Tambsil liquid organic fertilizer dose does not guarantee the absorption of nitrogen nutrients by plants, so the rate of addition of growth is also not significant (not real).

That liquid organic fertilizer contains an element of potassium which plays an important role in every plant metabolic process, namely in the synthesis of amino acids and proteins of ammonium ions and plays a role in maintaining turgor pressure well This allows a smooth metabolic process and ensures continuity cell. Furthermore, Sutejo (2002) argued that the function of Nitrogen (N) for plants, especially vegetable plants, is a constituent of proteins for plant shoot growth and fosters vegetative growth. Giving Nitrogen a lot will cause vegetative growth to take place well and the color of the leaf becomes dark green, but the excess will slow the ripening process. Fiber plants with excess nitrogen will weaken the fibers, while for grain crops will cause plants to collapse. Nitrogen deficiency usually causes depressed plant growth and leaves to dry out. The symptoms of chlorosis first appear on old leaves, while young leaves remain green.

Furthermore Jamilah, Erianto dan Fatimah. 2017, describe that nitrogen contained in liquid organic fertilizer acts as a constituent of proteins, whereas phosphorus and calcium play a role in spurring the process of meristem tissue division, stimulating root growth and leaf development. Potassium regulates the opening and closing of the stomata. Optimal stomata regulation will control plant transpiration and increase the reduction of carbon dioxide which will be converted into carbohydrates. Therefore, in general the macro nutrients contained in liquid organic fertilizer will increase plant photosynthetic activity, thereby increasing the carbohydrates produced as food reserves.



Tambsil liquid organic fertilizer is a complete liquid organic fertilizer formulated to meet the needs and challenges of farmers and entrepreneurs in the fields of agriculture and plantations in order to obtain prime yields or crops. This liquid organic fertilizer contains complete nutrients, both macro and micro essential elements for soil fertility and plant growth. This fertilizer is a liquid that is able to be absorbed by plants through the stomata or leaf mouth and functions as a stimulator and is very safe for human and animal health and is very environmentally friendly (Anonymous, 2017).

### **3.2. Number of Leaves per Clump**

The results of the variance analysis showed that the administration of Tambsil liquid organic fertilizer had a very significant effect on the observation of the number of leaves per clump of shallots at the age of 20 days, 40 days and 60 days after planting (Appendix Table 2). Providing Tambsil liquid organic fertilizer can increase the availability and uptake of nutrients by plants, so as to improve plant growth and yield. Nutrients found in liquid organic fertilizer can increase the yield of shallot plants because the role of organic fertilizer not only improves the physical and biological properties of the soil but also the chemical properties of the soil. The nutrients available from liquid organic fertilizer will be utilized by plants to stimulate photosynthesis, the results of photosynthesis are translocated to all parts of the plant to stimulate vegetative and generative development of plants. Nutrients contained in liquid organic fertilizer are micro and macro nutrients.

According to Hamdani, J. S. 2008, another benefit of liquid organic fertilizer is adding nutrients (N and P) so that it can increase crop production. Liquid organic fertilizer given through leaves will be more evenly distributed, so that it can overcome nutrient deficiency quickly. Leaf fertilizer can strengthen plant tissue and accelerate and improve growth.





**Table 2.** Mean Leaves of Shallot Plants per Clump with the Use of Tambill Liquid Organic Fertilizers in Various Doses and Age of Observation

Dosage Treatment Tambsil Liquid Organic Fertilizer	Average number of leaves per clump On Onion Plants		
	20 days (strand)	40 days (strand)	60 days (strand)
DT0 = Without Tambsil Fertilizer (Control)	6,33 a	11,00 a	15,83 a
DT1 = Tambsil Fertilizer 2,0 cc per liter water	9,17 b	15,33 b	20,17 b
DT2 = Tambsil Fertilizer 4,0 cc per liter water	10,83 c	16,83 c	22,33 c
DT3 = Tambsil Fertilizer 6,0 cc per liter water	11,83 d	18,83 d	23,67 d
DT4 = Tambsil Fertilizer 8,0 cc per liter water	11,67 d	19,17 d	24,83 d
DT5= Tambsil Fertilizer 10,0 cc per liter water	11,33 cd	18,33 d	24,00 d
BNT 5%	0,55	1,07	1,13

Note: The numbers accompanied by the same letters in the same column are not significantly different from the 5% BNT Test

Table 2 shows that the increase in the administration of Tambsil liquid organic fertilizer dose is proportional to the increase in the number of leaves during the growth of onion plants. The smallest number of red onion leaves was shown treatment without fertilizer (DT0) Tambsil organic liquid (15.83 strands) and statistically (BNT 5%) was always significantly different from treatments with Tambsil liquid organic fertilizer doses.

The highest number of leaves was achieved treatment of giving Tambsil liquid organic fertilizer (DT4) 8.0 cc per liter of water (24.83 strands) and statistically (BNT 5%) was not significantly different from the treatment of giving Tambsil liquid organic fertilizer dose (DT5) 10,0 cc per liter of water (24.00 strands) and treatment for giving a dose of Tambsil liquid organic fertilizer (DT3) 6.0 cc per liter of water (23.67 strands).

This shows that the treatment of giving a dose of Tambsil liquid organic fertilizer has reached the optimum dose (appropriate). With the increase in the addition of Tambsil liquid organic fertilizer dosage of 5.0 cc per liter of water, the increase in the number of leaves is less significant (not visible) or not statistically significantly different from the treatment of Tambsil liquid organic fertilizer 4.0 cc per liter of water, so the increase in dosage does not need to be done again.

According to Prihmantoro in Gerald (2014) Macro nutrients found in liquid organic fertilizers are N, P, K, Ca, Mg, and S. Macro nutrients are nutrients needed in large quantities. This



statement is in accordance with the results of Bambang Wicaksono Hariyadi, Kogoya and Bambang Gunawan (2017) research which states that there is a very significant effect on plant height, leaf number and wet weight per plant and plant wet weight per polybag of land water spinach (*Ipomoea reptans* Poir) towards providing Tambsil liquid organic fertilizer. The treatment of Tambsil liquid organic fertilizer dosage of 10 cc per liter of water results in the highest growth and yield of land water spinach, although not significantly different from the treatment of 8 cc Tamblil liquid organic fertilizer per liter of water (optimum).

The advantage of using liquid organic fertilizer is that it works faster than using fertilizer in solid form. Liquid organic fertilizer has disadvantages, which are volatile, can damage leaf tissue and absorption depends on the leaf surface layer, namely fur and cuticle layer (Lingga, 2003).

The use of nitrogen fertilizer will cause damage to the plant. In general, many farmers use nitrogen fertilizer in vegetable crops, such as kale, spinach and others in greater amounts than other fertilizers, because nitrogen fertilizer is relatively cheap compared to other fertilizers. Nitrogen fertilizer with a dose of 250 kilograms / ha will provide the best growth in plant height, number of leaves, leaf area, stem diameter and production of kale plants, spinach plants and mustard plants (Parman, S. 2007).

The benefits of Tambsil liquid organic fertilizer is to fertilize plant growth, accelerate the formation of shoots and flowers as ovaries, overcome nutrient deficiencies in plants which can result in disrupted or dead plant growth. In addition, this increases plant resistance to disease attacks, especially fungi or fungi, is able to overcome the shortage of basic fertilizer use, accelerate the harvest period, extend plant life and increase the number of excerpts for annual and annual plant species, and improve plant growth on infertile land or marginal land (Anonymous, 2017).

### **3.3. Bulbs and Gross Weight per Plant Clump**

The results of the variance analysis showed that the treatment of giving a dose of Tambsil liquid organic fertilizer had a very significant effect on the observed variables of the number of bulbs and wet weight per onion clump (Appendix Table 3). These results indicate that the administration of Tambsil liquid organic fertilizer can increase the availability and uptake of nutrients by plants, so as to improve plant growth and yield. Nutrients found in liquid organic fertilizer can also increase the growth and yield of shallots because the role of organic fertilizer not only improves the physical and biological properties of the soil but also the chemical properties of the soil. The nutrients available from liquid organic fertilizer will be utilized by plants to stimulate photosynthesis, the photosynthesis results are translocated to all parts of the plant to spur vegetative and generative development of plants.





According to Napitupullu dan Winarto. (2009). fertilizers containing nitrogen increases nutrient availability immediately to plants. In addition it saves time, labor and transportation costs.

Table 3. Shows that an increase in the administration of Tambsil liquid organic fertilizer is followed by an increase in the number of bulbs and wet weight per clump of shallots. The lowest number of bulbs and wet weight per clump was indicated by plants without the administration of Tambsil liquid organic fertilizer (DT0) or control treatment (6.33 bulbs and 112.77 grams) and statistically (5% BNT) was significantly different from dosing treatments other Tambsil liquid organic fertilizers.

The highest number of bulbs and gross weight per clump was achieved by treatment of Tambsil liquid organic fertilizer (DT4) dosage 8.0 cc per liter of water (13.00 bulbs and 241.43 grams), followed by the treatment of Tambsil liquid organic fertilizer (DT5) 10.0 cc per liter of water (12.67 bulbs and 225.00 grams), (DT3) 6.0 cc per liter of water (12.33 bulbs and 214.17 grams), but statistically (BNT 5 %) the three treatments for the Tambsil liquid organic fertilizer dosage were not significantly different. This proves that the administration of Tambsil liquid organic fertilizer is quite useful and able to meet the needs for the growth and yield of onions.

**Table 3.** Average Bulbs Amount and Wet Weight per Clump of Shallot Plant by Administration Various Doses of Tambil Liquid Organic Fertilizer

Dosage Treatment Tambsil Liquid Organic Fertilizer	Average Number of Bulbs	Average Gross Weight per Clump of Plants (gram)
	6,33 a	112,77 a
DT0 = Without Tambsil Fertilizer (Control)	9,67 b	158,43 b
DT1 = Tambsil Fertilizer 2,0 cc per liter water	10,67 b	188,63 c
DT2 = Tambsil Fertilizer 4,0 cc per liter water	12,33 c	214,17 d
DT3 = Tambsil Fertilizer 6,0 cc per liter water	13,00 c	241,43 d
DT4 = Tambsil Fertilizer 8,0 cc per liter water	12,67 c	225,00 d
BNT 5%	1,55	23,74

Note: The numbers accompanied by the same letters in the same column are not significantly different from the 5% BNT Test

Liquid organic fertilizer has several benefits. It encourages and increases the formation of leaf chlorophyll, thereby increasing the ability of plant photosynthesis and absorption of nitrogen ions from the air, increasing plant vigor so that the plant becomes sturdy and strong. In addition, this also increases plant resistance to drought, weather stress and attacks of disease-causing



pathogens, stimulates the growth of production branches, and increases the formation of flowers and ovaries, and reduces the loss of leaves, flowers and ovaries (Lingga and Marsono, 2004).

This is in accordance with the results of research by Rizqiani et.al. (2007) in beans, that administration of liquid organic fertilizer can increase the number of leaves, number of branches, leaf area, leaf area index, root length, number of pods, pod fresh weight per plant and fresh weight of pods per hectare.

Manullang, Abdu dan Puji.(2014), study show that the administration of Amazing Bio Growth liquid organic fertilizer can increase cucumber production. Likewise in Nani Sumarni dan Achmad Hidayat. (2005). Study that the dose of Supra use of liquid organic fertilizer on potato plants was recommended as much as 4.0 ml to increase the production of potato bulbs.

Found that the planting media had an effect on the number of leaves, bulb diameter, fresh bulb weight, dry weight of wind bulbs, oven dry tuber weight, fresh stover weight, dry wind stover weight, and oven dry weight. Soil media plus manure yields the highest number of leaves, ie 51.58 strands, the largest bulbs diameter is 2.73 cm, the heaviest weight of fresh tubers is 72.91 g, the heaviest weight of dried bulbs is 63.64 g, and the heaviest weight of oven dried bulb is 50.68 g. Soil media plus manure and fuel husk produced the heaviest fresh weight of 22.95 g, the heaviest dry weight of the wind of 2.68 g, and the heaviest oven dry weight of 1.79 g (Purwanti, Hidayati, & Nurlina, 2017).

#### 4. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of observations and statistical analysis of this study, the following points are concluded: The administration of Tambsil liquid organic fertilizer has a very significant effect on the variable length of plant observation, number of leaves, number of bulbs and gross weight per clump of onion plants (*Allium ascalonicum L.*). The administration of Tambsil liquid organic fertilizer (DT4) 8.0 cc per liter of water always shows the highest growth and yield of onion (*Allium ascalonicum L.*), although statistically (BNT 5%) is not significantly different from the treatment of Tambsil liquid organic fertilizer (DT3) 6.0 cc per liter of water (optimum dose) and (DT4) 10.0 cc per liter of water. Further research can observe ways, times, doses of administration of liquid organic fertilizers in different climatic conditions, locations and commodities. For Surabaya area and its surroundings, the liquid organic fertilizer fertilizer dosage is recommended by 6.0 cc per liter of water (optimum dose).



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